**Multiplexers (MUX):**

Multiplexer is a combinational circuit that selects one of many input lines and direct it to a single output line. The selection of a particular input line is controlled by a set of select variables. Normally there are ( 2n ) input lines and ( n) select variables whose bit combination determines which input is selected. The 4-to-1 multiplexer is shown below:

 S1 S0 Y

 0 0 D0

 0 1 D1

 1 0 D2

1 1 D3

 So S1 D0 D1 D2 D3

 

 Y

There are: 2-to-1 MUX with 1 select variable

 4-to-1 MUX with 2 select variable.

8-to-1 MUX with 3 select variable.

. 16-to-1 MUX with 4 select variable

The circuit above can be implemented as an MSI chip, such a chip has four data inputs, two select variables and one output.

4-to-1 MUX

 D0

 D1 Y

 D2

 D3

 S1 S0

**Boolean function implementation using MUX :**

Boolean function of ( n )variables can be implemented with a multiplexer of either n, n-1, n-2…… select variables.

***Ex***: Implement the following function with (8-to1) and (4-to-1) MUX:

F(X,Y,Z)= ∑(1,2,6,7).

***First***: by using (8-t0-1) MUX:

 S2  S1 S0

 X Y Z F

 0 0 0 0 D0=0

D0

D1

D2

D3 8-to-1

D4 Mux F

D5

D6

D7

 S2 S1 S0

 0 1

 0 0 1 1 D1=1

 0 1 0 1 D2=1

 0 1 1 0 D3=0

 1 0 0 0 D4=0

 1 0 1 0 D5=0

 1 1 0 1 D6=1

 1 1 1 1 D7= 1

 X Y Z

***Second***: by using (4-t0-1) MUX:

X Y Z F

0 0 0 0

 Z Z 0 1

D0

D1

D2 4-to-1

D3 MUX

 S1 S0

0 0 1 1 D0=Z

0 1 0 1

O 1 1 0 D1=Z

1 0 0 0

1 1 0 1

1 1 1 1 D3=1

 X Y